

B.Sc. Semester - 2 (CBCS) Examination
June/July-2022 [OLD COURSE]
PHYSICS (CORE)

Time: 2:30 Hours**Marks: 70****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate marks.

Q. 1 (a) Answer the following : (Any one) (7)

- (1) Derive formula for velocity of transverse wave on a string. Explain the formation of standing waves with necessary diagram.
- (2) Explain doppler effect and derive formula of apparent frequency for
 - (i) Observer stationary and source moving
 - (ii) Source stationary and observer moving
 - (iii) Source and observer both are moving

(b) Answer anyone of the following: (4)

- (1) A sonometer wire of length 1.25 meter is stretched by tension of 64 N. The mass of the string is 1.5 g . Calculate the frequency of the wire if it vibrates in four loops.
- (2) Write a short note on Acoustics of buildings.

(c) Answer any three : (3)

- (1) Standing waves are produced when two identical _____ waves with equal velocities superimpose each other.
- (2) For transverse vibration of a string, law of tension states that the fundamental frequency is directly proportional to _____.
- (3) A train passing through a station. The apparent frequency of sound for a passenger on the platform is _____.
- (4) The signals of sound coming from multiple reflections which form continuous sound of decreasing frequency are known as _____.
- (5) The phenomenon of periodic variation of intensity of sound when two sound waves of slightly different frequencies interfere is called _____.

Q. 2 (a) Answer the following : (Any one) (7)

- (1) Explain working of bridge rectifier with necessary diagram. Derive formulae for average DC current and root mean square current for bridge rectifier.
- (2) Explain CB and CE characteristics of transistor.

(b) Answer anyone of the following: (4)

- (1) What is Zener diode? Explain its breakdown and characteristics.
- (2) In a common base circuit of a transistor, $\alpha = 0.95$. If the base current is 80 μA . Find out emitter current and collector current.

(c) Answer any three: (3)

- (1) The capacitive reactance for d.c. is _____
- (2) Define cut in/threshold voltage of the diode.
- (3) Which electronics component is used as a stabilizer in rectifier circuit?
- (4) Define current amplification factor α .
- (5) power gain is the highest in _____ connection of a transistor.

Q. 3 (a) Answer the following : (Any one)**(7)**

- (1) Explain Young's double slit experiment with schematic diagram. Derive equations for optical path difference for bright and dark fringe conditions.
- (2) Explain Newton's ring experiment with diagram. Derive expressions for condition of bright and dark rings.

(b) Answer anyone of the following:**(4)**

- (1) Distance between two narrow and parallel slits is 0.1nm and the width of the fringes formed on the screen is 4nm . If the distance between the screen and the slit is 1 meter , calculate the wavelength of the light used.
- (2) State the conditions for sustained interference.

(c) Answer any three:**(3)**

- (1) Prism can produce two coherent sources. (True/False)
- (2) Newton's ring illustrates the phenomenon of _____.
- (3) State methods of obtaining coherent sources.
- (4) In Young's experiment, if the distance between the slits is decreased, the fringe width will _____.
- (5) State the methods of obtaining coherent sources.

Q. 4 (a) Answer the following : (Any one)**(7)**

- (1) Explain diffraction pattern of a straight edge.
- (2) Explain Fraunhofer diffraction at plane diffraction grating.

(b) Answer anyone of the following:**(4)**

- (1) Distinguish between Prism spectrum and Grating spectrum.
- (2) A plane wavefront of light of wavelength $5890\text{ \AA}$ falls on as aperture and the diffraction pattern is observed in as eyepiece at a distance 1m from the aperture.
Find the radius of 81^{st} half period element and the area of a half period zone.

(c) Answer any three :**(3)**

- (1) The focal length of zone plate is inversely proportional to _____.
- (2) Diffraction will not occur if the wave is coherent. (True/False)
- (3) Define: positive zone plate
- (4) The area of each half period zone is equal to _____. ($\pi b\lambda$)
- (5) Define : Grating spectra.

Q. 5 (a) Answer the following : (Any one)**(7)**

- (1) Explain dispersion of prism. Derive formula for angular dispersion and dispersive power.
- (2) Explain construction, action and uses of Nicol prism with necessary diagrams.

(b) Answer anyone of the following:**(4)**

- (1) A beam of light is passed through two Nicols in series. In a particular setting, maximum light is passed by the system is 500 units . Calculate the intensity of transmitted light if one of the nicols is rotated by (1) 20° and (2) 45°
- (2) With suitable diagram, explain polarization by double refraction.

(c) Answer any three :**(3)**

- (1) State Brewster's law.
- (2) Give one example of each of positive and negative uniaxial crystals.
- (3) State any two methods to produce plane polarized light.
- (4) State Malus law.
- (5) Splitting of white light into its constituent colours is known as _____.
